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PROJECT SUMMARY
FOR A CONSTRUCTION PERMIT APPLICATION
FROM
INDECK-ELWOOD, LLC
FOR THE
INDECK-ELWOOD ENERGY CENTER
ELWOOD, ILLINOIS

Site Identification No.: 197035AAJ
Application No.: 02030060
Date Received: March 21, 2002

Schedule
Public Comment Period Begins: April 7, 2003
Public Hearing: May 22, 2003
Public Comment Period Closes: June 21, 2003

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Permit Analyst: Shashi Shah
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I. INTRODUCTION

Indeck-Elwood, LLC (Indeck) has requested a permit to construct a nominal 660-megawatt electric power plant in Elwood, Illinois. Power will be generated by two circulating fluidized bed (CFB) boilers.

The Illinois EPA has prepared a draft of the construction permit that it would propose to issue for the plant. The permit is intended to identify the applicable rules governing emissions from the plant and to set limitations on those emissions. The permit is also intended to establish appropriate compliance procedures for the plant, including requirements for emissions testing, continuous emissions monitoring, record keeping, and reporting. The Permittee will have to carry out these procedures on an ongoing basis to demonstrate that the plant is operating within the limitations set forth by the permit and that emissions are being properly controlled. The Illinois EPA has also prepared a draft Acid Rain Permit and a draft Budget Permit for the proposed plant, to address requirements under the federal Acid Rain program and state's NOx Trading program.

II. PROJECT DESCRIPTION

Indeck has proposed to construct two CFB boilers, and associated equipment including solid fuel handling and storage; ash handling and storage; limestone handling and storage; cooling towers; and other ancillary operations.

The CFB boilers will be fired on coal as their primary fuel with capability to fire natural gas as a startup fuel to heat the bed, at which point combustion is maintained by firing of coal. The boilers may also fire supplemental fuels, such as petroleum coke and coal tailings, with the coal.

In a CFB boiler, fuel is burned in "floating" bed with air forced in from the bottom. The air pressure floats the bed within the combustion chamber allowing the bed to behave like a fluid. This provides certain benefits for reducing emissions. First, fluidized bed combustion reduces formation of nitrogen oxides (NO_x). Air is introduced at multiple levels, both as fluidizing air and as secondary air over the top of the bed, which stages combustion avoiding the combustion conditions that favors formation of NO_x. The high degree of mixing in the bed provides uniform temperatures throughout the bed. Temperature and residence time in the combustion chamber are sufficient to keep emissions of CO and VOM to low levels. In addition, crushed limestone is usually added directly into the bed of a CFB boiler to absorb sulfur dioxide. In the bed, the limestone, and lime formed by calcination of the limestone, act to chemically absorb sulfur dioxide (SO_2) directly from the gases in the boiler, reducing SO_2 emissions

Hot combustion gases and entrained limestone flow up the boiler and through hot cyclones at the top of the combustion chamber. Particles captured in the cyclone are recirculated back to the bed for better utilization of the limestone sorbent.

Following the hot cyclone, Selective Non-Catalytic Reduction (SNCR) technology is employed for NO_x control. In SNCR, ammonia (NH_3) is injected into hot flue gases. The NH_3 reacts with NO_x present in the flue gases, reducing the NO_x back to nitrogen (N_2), forming water (H_2O) in the process.

Particulate matter (PM) in the flue gases is captured by a fabric filter, also known as a baghouse. At the baghouse, the flue gas has been cooled to less than 400 ^{0}F. In addition to removing PM, removal of SO_2 and other pollutants occurs in the baghouse and in the ductwork leading to the baghouse as pollutants are absorbed by particles of limestone and lime that are captured by the baghouse.

Bed ash and fly ash from the CFB boilers will be conveyed to an ash silo. The system for ash movement contains separators with final particulate clean up through fabric filter collectors. Solid fuel will be transferred by covered conveyors at the solid fuel handling facilities. Limestone will be transferred by enclosed conveyors from a limestone silo. A limestone truck dump with a fabric filter and enclosure will also be installed.

III. PROJECT EMISSIONS

The potential emissions of the proposed boilers are listed below. Potential emissions are calculated based on continuous operation at the maximum load. Actual emissions will be less to the extent that the plant does not operate year round and at its maximum capacity.

Pollutant	Potential Emission (tons per year)
Particulate Matter (PM)	384.0
Sulfur Dioxide (SO_2)	3840.0
Nitrogen Oxides (NO_x)	2560.0
Carbon Monoxide (CO)	2816.0
Volatile Organic Material (VOM)	102.4
Fluorides	50.2
Sulfuric Acid Mist	10.2
Beryllium	0.004
Mercury	0.1
Hydrogen Chloride	988.0
Hydrogen Fluoride	50.2
Lead	0.31

Much smaller amounts of particulate matter, nitrogen oxides, carbon monoxide and volatile organic material will also be emitted from operations at the source including the auxiliary boiler, the storage and handling of coal, ash and limestone and certain bulk material preparation operations involving gas combustion dryer.

IV. APPLICABLE EMISSION STANDARDS

All emission sources in Illinois must comply with Illinois Pollution Control Board emission standards. The Board's emission standards represent the basic requirements for sources in Illinois. The various emission units in the proposed plant should readily comply with applicable Board standards.

The CFB boilers are also subject to the federal New Source Performance Standards (NSPS), 40 CFR 60 Subpart Da, for electric utility steam generating units. The NSPS sets emission limits for nitrogen oxides, sulfur dioxide and particulate matter emissions from the boilers. Requirements for testing, continuous emissions monitoring, record keeping, and reporting are also specified. Certain other new units are also subject to other NSPS. The Illinois EPA is administering NSPS in Illinois on behalf of the United States EPA under a delegation agreement.

V. OTHER APPLICABLE REGULATIONS

A. PREVENTION OF SIGNIFICANT DETERIORATION (PSD)

The proposed plant is a major new source subject to the federal rules for

Prevention of Significant Deterioration of Air Quality (PSD), 40 CFR 52.21. Under PSD, plant is major for emissions of nitrogen oxides, sulfur dioxide, particulate matter and carbon monoxide, with potential annual emissions of more than 100 tons for each of these pollutants for which the proposed location is an attainment area. The plant is also significant for sulfuric acid mist and fluorides because potential emissions exceed the PSD significant emission thresholds for these pollutants, 7 and 3 tons per year, respectively. The plant is not a significant source for lead emissions, for which the PSD significance threshold is set at 0.6 ton per year.

B. MAJOR STATIONARY SOURCES CONSTRUCTION AND MODIFICATION (MSSCAM)

The proposed plant is a major new source under the state rules for Major Stationary Source Construction And Modification (MSSCAM), 35 IAC Part 203. This is because the plant's potential emissions of volatile organic material (VOM) are more than 25 tons per year and the plant would be located in an area that is designated severe nonattainment for ozone.

C. MAXIMUM ACHIEVABLE CONTROL TECHNOLOGY (MACT)

The proposed plant is a major source for emissions of hazardous air pollutants (HAP). The potential HAP emissions from the plant will be greater than 10 tons of certain individual HAP i.e. hydrogen fluoride and hydrogen chloride, and more than 25 tons in aggregate for all HAP. Therefore, the plant is subject to case-by-case review under Section 112(g) of the Clean Air Act for use Maximum Achievable Control Technology (MACT) to control emissions of HAP, including mercury and other metals, hydrogen chloride and hydrogen fluoride, and various organic HAPs.

D. EMISSIONS REDUCTION MARKET SYSTEM (ERMS)

The proposed plant is considered to be a new participating source under Illinois' Emissions Reduction Market System (ERMS), 35 IAC Part 205. This is because emissions of VOM are expected to be greater than 10 tons during each allotment trading season (May through September). As a new participating source, Indeck would be required to obtain allotment trading units (ATU) under the ERMS for the plant's actual VOM emissions.

E. ACID RAIN PROGRAM

The proposed plant is an affected source and the CFB boilers are affected units for Acid Deposition: Title IV of the Clean Air Act, and regulations promulgated thereunder. These provisions establish requirements for affected sources related to control of emissions of pollutants that contribute to acid rain. One of these requirements is to operate pursuant to an Acid Rain permit. The Illinois EPA is proposing to issue the initial Acid Rain permit for the proposed plant in conjunction with issuance of the construction permit for the plant.

F. NOx TRADING PROGRAM

The CFB boilers would qualify as Electrical Generating Units (EGU) for purposes of 35 IAC Part 217, Subpart W, NO_x Trading Program for Electrical Generating Units. As an EGU, the Permittee would have to hold NO_x allowances for the NO_x emissions of the boilers during each seasonal control period. Another requirement of the NO_x Trading Program is to operate pursuant to a Budget permit. The Illinois EPA is proposing to issue the initial Budget permit for the CFB boilers in conjunction with issuance of the construction permit for the plant.

G. CLEAN AIR ACT PERMIT PROGRAM (CAAPP)

This plant would be considered a major source under Illinois' Clean Air Act Permit Program (CAAPP) pursuant to Title V of the Clean Air Act. This is because the plant would be a major source for purposes of the CAAPP because it is a major source for purposes of the above regulatory programs. Indeck would have to apply for its CAAPP permit within 12 months after initial startup of the plant.

VI. MAJOR STATIONARY SOURCE CONSTRUCTION AND MODIFICATION (MSSCAM)

For a major project, the state rules for Major Stationary Sources Construction and Modification (MSSCAM), 35 IAC Part 203 require: 1) an emission limit for volatile organic materials (VOM) that represents the Lowest Achievable Emission Rate (LAER), 2) compensating VOM emission reductions from other sources commonly called offsets, 3) an analysis of alternatives to the project, and 4) proof that other existing major sources owned by the permit applicant within Illinois are in compliance with applicable air pollution regulations. A discussion of these requirements follows.

A. Lowest Achievable Emission Rate (LAER)

LAER is defined at 35 IAC 203.301 as:

The most stringent rate of emissions based on the following:

1. The lowest emission limitation, which is contained in the implementation plan of any state for such class or category of stationary source, unless it is demonstrated that such limitation is not achievable;

2. The lowest emission limitation which is achieved in practice or is achievable by such a class or category of stationary source; or

3. The applicable New Source Performance Standard.

Indeck prepared a LAER demonstration identifying the control techniques and emission limits required of other similar operations to control VOM. This demonstration included information from the United States EPA's *BACT/LAER Clearinghouse*, which showed that coal-fired boilers control VOM with good combustion practices. In general VOM is emitted as a result of incomplete combustion of fuel. VOM is controlled by providing adequate fuel residence time and high temperature in combustion zone to ensure complete combustion. The Illinois EPA has determined that LAER for the CFB boilers is the use of very good combustion practices.

B. Emission Offsets

The emissions associated with a major project in a nonattainment area must not interfere with the state plan to achieve attainment of the national ambient air quality standards. This plan consists of new programs and regulations designed to achieve the national standards and is based on a detailed analysis of current and projected emission and air quality levels. In order to account for the emissions increase from a major project proposed in a nonattainment area, the applicant must provide compensating emission reductions from other sources that have not been relied on in the attainment plan. These emission reductions are commonly referred to as emission offsets. Indeck must obtain creditable emission decreases or offsets from the existing sources in the Chicago ozone nonattainment area.

Because the Chicago Area is a severe ozone nonattainment area, emission offsets at a ratio of 1.3:1.0, i.e., for each ton of VOM emissions from a project, 1.3 ton of offsets must be provided. At this ratio, Indeck is required to provide an emission offset of 140.4 ton per year. Indeck is working with 3M to obtain emission offsets for a reduction in VOM emission at its plant in Bedford Park.

C. Existing Source Compliance

Indeck operates one source in Illinois, the NRG Rockford Energy Center. Indeck has stated that this plant is in compliance.

D. Analysis of Alternatives to the Proposed Project

Indeck has provided an analysis of alternatives that concludes that from an economic, environmental, and energy viewpoint, the benefits of the proposed outweigh other alternatives (such as, building the plant elsewhere). In this regard, electricity is essential to modern society and a reliable and affordable supply of electricity is important to public well being. New coal-fired power plants are beneficial as they increase the potential sources of electricity and generate competition among suppliers of electricity. New plants allow and facilitate the reduced operation and retirement of older less-efficient and more polluting power plants. They also allow local Illinois coal to be used as fuel. While energy conservation and alternative power sources, such as wind power, are also desirable actions to reduce emissions and other environmental impacts associated with generation of electricity, they do not address the need for new power generation. In addition, given the current technology for transmission of power, it is desirable that power plants generally be located near the users of the electricity.

VII. BEST AVAILABLE CONTROL TECHNOLOGY (BACT)

Under the PSD rules, the Permittee must demonstrate that Best Available Control Technology (BACT) will be used to control emissions of NO_x, SO_2, CO, PM/PM_{10}, sulfuric acid, fluorides and beryllium from the proposed plant. Indeck has provided a detailed BACT demonstration in its application.

A. Introduction

The Clean Air Act defines BACT as:

"an emission limitation based on the maximum degree of reduction which the permitting authority, on a case-by-case basis, taking into account energy, environmental and other costs, determines is achievable."

BACT is generally set by a "Top Down Procedure." In this procedure, the most stringent control requirement in practice elsewhere is assumed to constitute BACT for a particular project, unless the impacts associated with the control requirements are shown to be excessive. This approach has generally been followed by the Illinois EPA. A summary of the proposed BACT Determination is provided in Attachment 1.

B. BACT Discussion for the CFB Boilers:

Nitrogen Oxide (NOx) - Review of the United States EPA's *BACT/LAER Clearinghouse* indicates that selective non-catalytic reduction in combination with combustion controls as proposed by Indeck, are the NO_x control measures used on new CFB boilers. Other add-on control devices have not been used.

Based on available data, the following technologies were reviewed as possible control options for NO_x: 1) selective catalytic reduction, 2) selective non-catalytic reduction, and 3) combustion controls. In addition, Integrated Gasification Coal Combustion (IGCC) was evaluated as an alternative production process for generating electricity from coal.

Selective catalytic reduction (SCR) uses a chemical reaction to remove NO_x from the exhaust gas. The reaction between gaseous NO_x and a reagent, i.e. ammonia (NH_3), as it passes through a porous ceramic bed or screen impregnated with catalyst, reduces NO_x back to N_2. This reaction takes place at a temperature of about 750 °F. The temperature of exhaust gas from the baghouse will be well below this, about 270 °F, making it unsuitable for SCR operation without reheating the gas. Particulates in the exhaust before the baghouse would be present in sufficient concentration to coat and poison the catalyst if SCR was installed before the baghouse. SCR is not a demonstrated technology for control of NO_x emissions from CFB boilers. In addition, new pulverized coal boilers, for which SCR is feasible, achieve similar levels of NO_x emissions as CFB boilers equipped with SNCR.

Selective non-catalytic reduction (SNCR) also involves a reaction with ammonia but without the use of a catalyst. The effectiveness of this method is dependent on initial NO_x concentration and temperature, residence time and mixing in the reaction zone. The temperature of the gas in the reaction zone must be in the range of 1600 °F to 1800 °F to be suitable for effective operation of an SNCR system. This range is present in the intermediate zone of the CFB boilers after the hot cyclones. As SNCR avoids the need for a catalyst to facilitate the NO_x reduction reaction, it is also a much simpler control technique that is appropriately applied to CFB boilers, given their low NO_x characteristics compared to pulverized coal boilers.

Integrated Gasification Coal Combustion (IGCC) is a two-stage process used for the production of electricity. In IGCC, coal or other fuel is first gasified to produce a synthetic gaseous fuel. This gaseous fuel is then fired combined cycle turbines to generate electricity. A review of the small number of existing IGCC projects indicates that IGCC achieves NOx emission rates that are similar to those achieved by new power plants with boilers that directly fire coal. This similarity in performance is generally explainable because although the synthetic fuel produced by IGCC is in a gaseous state, it has low heat content. Efficient combustion of this fuel in a turbine requires temperatures and oxygen levels in the burners that prevent NO_x emissions from being lower than those achieved by modern pulverized coal and CFB boilers equipped with SCR and SNCR, respectively. In addition, IGCC is still a developing technology and existing IGCC plants have received substantial grants from the United States Department of Energy. The higher costs and the uncertainties associated with IGCC would prevent the proposed plant from being developed. At the present time, this would also likely be the case for other similar power plant projects that are being developed primarily with private (non-governmental) financing.

Accordingly, the use of SNCR in conjunction with the inherent low NO_x character of CFB boilers is considered BACT for emissions of NO_x from the proposed CFB boilers.

Sulfur dioxide (SO_2) - Technically feasible SO_2 control alternatives for the CFB boilers include limestone addition to the bed by itself and limestone bed addition in combination with a spray drying system or flue gas desulfurization (FGD) system. In addition, use of IGCC was considered as a process alternative to reduce SO_2 emissions.

Spray drying systems are used on some CFB boilers in conjunction with bed addition of limestone. However, this appears to be a financial decision based on the cost and availability of limestone, as to the most economical way to meet the applicable SO_2 emission limitation. In circumstances where limestone is not readily available, rather than purchase a larger volume of limestone, the plant may prefer to purchase a small volume of lime, which has already been calcined, for use in a dray drying system. Thus the relevant issue for BACT is the SO_2 emission limitation that is established. In this regard, the permit is based on achieving approximately 98 percent control of sulfur present in the design coal supply for the boilers. This is a stringent level of SO_2 control, consistent with the level of SO_2 control required at other new coal-fired power plants. A higher level of SO_2 removal would be required at the proposed plant as petroleum coke, with its higher sulfur content, would be used to supplement the fuel supply to the boilers.

None of the CFB boilers listed in the *BACT/LAER Clearinghouse* show use of an FGD system. FGD systems are used on pulverized coal boilers, which must rely on an add-on post combustion FGD system for control of SO_2 emissions. The emission rates and levels of SO2 control achieved on new pulverized coal boilers with such systems is comparable to the level of control to be achieved with the proposed CFB boilers.

In IGCC, the raw fuel gas is treated to remove sulfur compounds before the fuel gas is burned in the turbines. Available information does not indicate that IGCC plants are achieving significantly lower SO_2 emission rates than would be required of the proposed CFB boilers. An exact comparison of SO_2 emission rates with IGCC is not possible because of differences in the sulfur content of the fuel supply to existing IGCC plants. In addition, the SO2 emissions at an IGCC plant also include "non-combustion" emissions from the chemical process equipment used to convert the recovered sulfur into elemental sulfur for sale or disposal. These appear to significantly add to the total SO_2 emissions of an IGCC plant.

Limestone bed addition is a standard feature in operation of a CFB boiler. This SO_2 control alternative has been demonstrated to be reliable, effective, and would not result in adverse economic, energy, or environmental impacts. Based on these criteria, the use of limestone addition to the bed to achieve is found to be BACT for the CFB boilers. At the same time, the permit allows for a spray drying system to be used, in the event that Indeck chooses to do so.

Particulate matter (PM) – For the CFB boilers, the alternative controls for particulate matter emissions are fabric filters and electrostatic precipitators. Use of IGCC was also considered. Wet scrubbing was not considered a demonstrated control technique for the boilers and does not offer more stringent levels of control for particulate matter than a baghouse.

For CFB boilers, the standard PM control device is fabric filtration with a baghouse. Fabric filters are very effective at filtering particulate matter out of the flue gases. The composition of the flue gases entering a baghouse from a CFB boiler is such that a baghouse can be reliably used to control PM emissions. Information for IGCC plants does not show significantly lower PM emission rates with IGCC.

For particulate matter, BACT for the CFB boilers is effective use of baghouses.

Carbon monoxide (CO) - Control of the emissions of CO from combustion units may be accomplished in two ways: (1) design of the combustion process and operation with good combustion practices to minimize the formation of CO, and (2) catalytic oxidation of CO after it has been formed in the combustion process. In addition, use of IGCC was considered as a process alternative for the plant to reduce SO_2 emissions.

Catalytic oxidation has been utilized on some combustion units but is considered technically infeasible on coal-fired boilers. While IGCC appears to achieve significantly lower CO emissions than a boiler power plant, an exact comparison is difficult because of CO emissions associated with the flare system that is present with IGCC to deal with upsets of the gasification equipment. However, use of IGCC can be eliminated as BACT due to its accompanying economic impacts, which would make the project no longer viable.

Good combustion practices are concluded to be BACT for control of CO emissions from the CFB boilers.

Beryllium - Beryllium is emitted as a component of the particulate matter emitted from the boilers. Therefore, use of a baghouse as BACT for particulate matter also represents use of BACT for beryllium.

C. BACT Discussion for Other Emission Units

The application also addresses BACT for other emission units at the proposed plant. Appropriate control measures are proposed. These include use of baghouses and implementation of other stringent control measures to control process particulate matter and fugitive dust emissions from material handling operations. For the ancillary boiler, natural gas be the sole fuel and low-NO_x burners will be used to minimize NO_x emissions.

VIII. MAXIMUM ACHIEVABLE CONTROL TECHNOLOGY (MACT)

The proposed plant is a major source of hazardous air pollutants (HAP) with potential annual emissions of hydrogen chloride and hydrogen fluoride greater than 10 tons. A case-by-case MACT determination is required for plant.

The CFB boilers are the principle source of HAP emissions at the plant, due to the presence chlorine, fluorine, mercury and other heavy metals in the fuel for the boilers. The mercury emission rate for the CFB boilers was determined based upon the case-by-case analysis presented in the application. The mercury emission rate used to calculate potential emissions is 0.000004 lb/million Btu consistent with other recently issued permits. Given the nature of the data on mercury emissions from coal fired boilers, the Permit establishes four alternatives to compliance with the emission rate. These alternatives are achieved as

(1) Achievement of a removal efficiency of 95 percent achieved without injection of activated carbon or other similar material specifically used to control emissions of mercury;

(2) Injection of powdered activated carbon or other similar material for the maximum practicable degree of mercury removal;

(3) Compliance with the requirement for effective control of mercury emissions as may be established in a revised permit if the Permittee demonstrates that it cannot reasonably obtain performance guarantees or engineering confirmation for compliance with the specified emission rate or control efficiency; or

(4) The requirements for control of mercury emissions established by USEPA, once applicable rules are adopted by USEPA.

The hydrogen chloride emission rate was determined based upon the case-by-case analysis presented in the application. The emission rate used to calculate potential emissions is 0.04 lb/million Btu. Given the nature of the data on the hydrogen chloride emissions from coal fired boilers, the Permit provides for lowering this limit following evaluation of the actual performance of the control measures. In addition, the Permit also establishes alternatives to compliance with this emission rate, similar to the alternatives established for mercury.

The Illinois EPA has determined that the MACT for fluorides will be achieved by the specific control measures for particulate matter, sulfur dioxide, and hydrogen chloride.

For other emission units, emissions of HAP will be appropriately controlled by the measures required as BACT and LAER as HAP will be present in the particulate matter and volatile organic material emissions from the units.

IX. AIR QUALITY ANALYSIS

A. Introduction

The previous discussion addressed emissions and emission standards. Emissions are the quantity of pollutants emitted by a source, as they are released to the atmosphere from a stack. Standards are set limiting the amount of these emissions primarily as a means to address the quality of air. The quality of air as we breathe it or as plants and animals experience it, is known as ambient air quality. Ambient air quality considers the emissions from a particular source after they have dispersed following release from a stack, been added to the background level of pollutants in the air entering the region, and joined with the pollutants emitted from other nearby sources.

The concern for pollutants in ambient air is typically expressed in terms of the concentration of the pollutant in the air. One form of this expression is parts per million. A more common scientific form is microgram per cubic meter, millionth of a gram in a cube of air one meter on a side.

The United States EPA has established standards, which set limits on the level of pollution in the ambient air. These ambient air quality standards are based on a broad collection of scientific data to define levels of ambient air quality where adverse human health impacts and welfare impacts may occur. As part of the process of adopting air quality standards, the United States EPA compiles the various scientific information on impacts into a "criteria" document. Hence the pollutants for which legal air quality standards exist are known as criteria pollutants. Based upon the nature and effects of a pollutant, appropriate numerical limitation(s) and associated averaging times are set to protect against adverse impacts. For some pollutants several standards are set, for others only a single standard has been established.

Areas can be designated as attainment or nonattainment for criteria pollutants, based on the existing air quality. Areas in which the air quality standard is met for a pollutant are known as attainment. If the air quality standard is exceeded, the area is known as nonattainment. Given the geographic extent of areas designated as nonattainment and the USEPA's process for redesignating an area to attainment, the air quality in some or all of an area designated as nonattainment may actually be in compliance with the relevant air quality standard.

In attainment areas one wishes to generally preserve the existing clean air resource and prevent increases in emissions which would result in nonattainment. In a nonattainment area efforts must be taken to reduce emissions to come into attainment. An area can be attainment for one pollutant and nonattainment for another.

Compliance with air quality standards is determined by two techniques -- monitoring and modeling. In monitoring one actually samples the levels of pollutants in the air on a routine basis. This is particularly valuable as monitoring provides data on actual air quality, considering actual weather and source operation. The Illinois EPA operates a network of ambient monitoring stations across the State.

Monitoring is limited because one cannot operate monitors at all locations. One also cannot monitor to predict the effect of a future source, which has not yet been built, or to evaluate the effect of possible regulatory programs to reduce emissions. Modeling is used for these purposes: modeling uses mathematical equations to predict ambient concentrations based on various factors, including the height of a stack, the velocity and temperature of exhaust gases, and weather data (speed, direction and atmospheric mixing).

Modeling is performed by computer, allowing detailed estimates to be made of air quality impacts over a range of weather data. Modeling techniques are well developed for essentially stable pollutants like particulate matter, NO_x, and CO, and can readily address the impact of individual sources. Modeling techniques for reactive pollutants, e.g., ozone, are more complex and have generally been developed for analysis of entire urban areas. They are not applicable to a single source with small amounts of emissions.

Air quality analysis is the process of predicting ambient concentrations in an area or as a result of a project and comparing the concentration to the air quality standard or other reference level. Air quality analysis uses a combination of monitoring data and modeling as appropriate.

B. Indeck’s Air Quality Analysis

An ambient air quality analysis was conducted by a consulting firm, Earth Tech, on behalf of Indeck to assess the impacts of its emissions of PM, SO_2, NO_x and CO on ambient air quality. Under the PSD rules, this analysis must determine whether the proposed project will cause or contribute to a violation of any applicable air quality standard.

Modeling was done incorporating proposed new emissions at Indeck and major stationary sources in surrounding areas. The proposed plant consists of two CFB boilers and associated steam turbine generators. Additional combustion units at this proposed plant are an ancillary boiler, limestone dryers, and emergency diesel engines. There are also roads, cooling towers, and storage emission points that are accounted for in PM10 modeling. For certain of these units based on initial modeling that was performed, Indeck committed to lower emission rates to reduce its impact on PM_{10} air quality which is largely driven by these units with their relatively low points of release, located near the plant’s fenceline. The analysis performed conforms to the guidance and requirements of the United States EPA and the Illinois EPA. Background concentrations were added to modeled impacts for SO_2, NO_x and PM10 National Ambient Air Quality Standards (NAAQS). The highest values for the particular averaging period from recent Illinois EPA monitoring data at a representative site were used as background.

A PSD modeling analysis begins with a determination of whether the air quality impacts of a proposed project exceed Significant Impact Levels (SIL) for any pollutant and averaging period. If no SIL is exceeded, then further modeling is not required. If a SIL is exceeded, then regional modeling must be performed to address both PSD increment consumption and the NAAQS for each pollutant for each averaging period for which the SIL is exceeded.

The results of the modeling to determine impacts of the proposed plant are provided below:

Results of the Preliminary Modeling Analysis (ug/m^3)

Pollutant	Averaging Period	Maximum Project Impact	Significant Impact Level (SIL)	National Ambient Air Quality Standard (NAAQS)
NO_2	Annual	6.78	1	100
CO	1-Hour	105.0	2,000	40,000
	8-Hour	32.6	500	10,000
SO_2	3-Hour	69.9	25	1,300
	24-Hour	13.6	5	365
	Annual	0.86	1	80
PM10	24-Hour	6.8	5	150
	Annual	1.0	1	50

The results show the maximum impacts of the proposed plant by itself with respect to the NAAQS. The modeling shows that the impacts of the proposed plant exceed the SIL for 24-hour and annual PM10, 3-hour and 24-hour SO_2, and annual NO_2. Therefore, a full PSD modeling analysis was required for these pollutants and averaging times. For CO, the modeled impacts are less than the significant impact levels so no further analysis is required for CO.

PSD areas have maximum allowable increases in the concentrations of sulfur dioxide, nitrogen oxides and PM_{10}, which cannot be exceeded. These limits are called "allowable increments." Under no circumstances is air quality in a PSD area allowed to deteriorate beyond the NAAQS. One part of a full regional PSD modeling analysis involves modeling the proposed project and all other PSD increment consuming sources in the area to determine whether PSD increments will be consumed. This modeling was done with an inventory of existing emission units supplied by Illinois EPA. The results of the increment consumption modeling are summarized below.

PSD Increment Consumption (ug/m^3)

Pollutant	Averaging Period	Maximum Increment Consumed	PSD Increment
NO2	Annual	8.9	25
SO2	3-Hour	69.3	512
SO2	24-Hour	13.9	91
PM10	24-Hour	6.7	30
PM10	Annual	1.1	17

The results demonstrate that the applicable PSD increments will not be exceeded by the operation of this plant and other existing PSD increment consuming sources.

A regional modeling study was also performed to assess whether the NAAQS for each applicable pollutant is protected. The peak modeled impacts for the proposed facility are added to the modeled impacts of other permitted sources in the area, and a representative background concentration. Background values for PM10 and SO_2 were taken from the Joliet monitor (1998 through 2000), while the NO_2 and CO background values were derived from the Braidwood monitor (1998 through 2000). The results of this analysis are contained below. The results indicate that the proposed plant will not cause or contribute to violations of the applicable NAAQS.

Results of the NAAQS Analysis (ug/m^3)

Pollutant/ Averaging Period	Project Impact	SIL Impact Level	Project & Existing Source Impact	Monitored Background Value	Maximum Future Concentration	Ambient Standard (NAAQS)
SO_2, 24-hour	82*	5	193.4	60.3	253.7	365
SO_2, 3-hour	175*	25	741.9	180.8	922.7	1300
NO_x, Annual	6.78*	1	20.7	18.9	39.6	100
PM10, 24-hour	6.8*	5	71.8	59.0	130.9	150
PM10, Annual	1.0	1	15.4	23.0	38.4	50

* Highest Second high concentration, consistent with the form of the NAAQS
** Sixth highest concentration, consistent with the form of the NAAQS

The regional modeling did show exceedances for PM10 and SO NAAQS in the vicinity of certain existing sources. However, these modeled exceedences are attributed to inaccuracies in the emissions inventory for existing emission units, such as default values for stack or exhaust temperature. Further, the modeling demonstrated that the proposed project does not contribute significantly to these exceedances. Therefore, the modeled exceedences are not considered to be relevant for the purpose of this PSD application.

Illinois EPA did request that Earth Tech address the PM10 impact of the proposed plant considering condensable PM10 emissions from the CFB boilers. While the PM10 impact from the CFB boilers is increased when the condensable PM10 is included, the maximum PM10 impact from the project as a whole is not noticeably changed. The inclusion of condensable PM10 emissions from the CFB boilers also does not change the size of the plant’s significant impact area for either 24-hour or annual PM10. This is because the PM impacts are attributable to emission units other than the CFB boilers.

In summary, the air quality modeling submitted by Earth Tech in support of the Indeck’s PSD application conforms to United States EPA and Illinois EPA guidance and shows that the proposed plant will not cause or contribute to violations of either the PSD increments or the NAAQS for appropriate criteria pollutants.

C. OZONE AIR QUALITY

The Illinois EPA has conducted an assessment of the impact of the proposed plant and other proposed coal-fired power plants on ozone air quality due to their emissions of NOx, an ozone precursor. The Illinois EPA decided to conduct this assessment because of the magnitude of the potential NOx emissions of these plants and concern that the plants would interfere with the established plans to bring current ozone nonattainment area into compliance.

The assessment was conducted using the complex Urban Airshed Model that was used by the Illinois EPA to develop Illinois’ attainment plans for compliance with the 1-hour ozone air quality standard. The assessment addressed not only the proposed Indeck-Elwood plant but also other proposed coal-fired power plants. The potential emission of these plants were overlaid on top of the emission data and other information for various episodes that were used in developing and evaluating Illinois’ attainment demonstration.

It was assumed that there would not be any additional reductions in the NOx emissions from existing power plants, which would continue to operate as currently required. These episodes are “actual” multi-day periods when exceedences of the ozone air quality occurred. The modeling that is performed evaluates what would now happen in the particular set of weather conditions given the reduced levels of emissions of ozone precursors that have been and will be achieved by the attainment plan. As part of the original modeling conducted for the attainment demonstration, the emissions and effect of new natural gas power plants was addressed.

The additional modeling that has been conducted shows that the new coal fired power plants would increase the levels of ozone in the air. However, these increases would not disrupt the attainment plan and would not interfere with timely attainment of the ozone air quality standard. In this regard, the new power plants do not add significantly to the ozone levels at the particular locations and times at which ozone levels are at their highest, at which ozone levels must be lowered for timely attainment of the ozone air quality standard.

D. OTHER IMPACTS

At the air quality impact levels for NO_x, SO_2, CO, and PM10 emissions as shown above, there will not be a significant effect on soils, vegetation or visibility.

X. REQUEST FOR COMMENTS

It is the Illinois EPA's preliminary determination that the proposed permit meets all applicable state and federal air pollution control requirements, subject to the conditions proposed in the draft permit.

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Attachment 1 – Summary of Proposed BACT and LAER Determinations

CFB Boilers:

Pollutant	Emission Limit	Control Measures
PM	0.015 lb/million Btu, 3-hour block average	Baghouse
SO_2	0.15 lb/million Btu, 30-day rolling average and 92% reduction if SO_2 > 0.1 lb/million Btu	CFB boiler technology, limestone addition to the bed, and baghouse
NOx	0.10 lb/million Btu, 30-day rolling average	CFB boiler technology and Selective Non-Catalytic Reduction (SNCR)
CO	0.10 lb/million Btu or 321.4 lbs/hour, 24-hour block average	CFB boiler technology and good combustion practices
VOM*	0.004 lb/million Btu or 11.7 lbs/hour, 3-hour block average	CFB boiler technology and good combustion practices
Fluorides	Addressed by limitation on SO_2	CFB boiler technology, limestone addition to the bed, and baghouse
Sulfuric Acid Mist	Addressed by limitation on SO_2	CFB boiler technology, limestone addition to the bed, and baghouse
Beryllium	Addressed by limitation on PM	Baghouse

* LAER

Auxiliary Boiler

Pollutant	Limitation	Control Measures
PM	--	Natural gas as sole fuel
NO_x	0.08 lb/million Btu	Low-NOx burners
SO_2	--	Natural gas as sole fuel
CO	0.10 lb/million Btu	Good combustion practices
VOM*	0.02 lb/million Btu	Good combustion practices
Other	--	Natural gas as sole fuel

* LAER

Limestone Dryer/Mills:

Pollutant	Limitation	Control Measures
PM	0.005 grain/dscf	Baghouse
NOx	0.073 lb/million Btu	Natural gas as sole fuel and good combustion practices
SO_2	--	Natural gas as sole fuel
CO	0.20 lb/million Btu	Good combustion practices
VOM*	0.02 lb/million Btu	Good combustion practices
Other	--	Natural gas as sole fuel

* LAER

Material Handling and Other Operations

Emission Unit	Limitation*	Control Measures
Material Receiving, Transfer, Handling, & Loading Operations	0.005 grain/dscf	Enclosure and baghouses
Storage Buildings	No visible emissions	Enclosure and spray systems at material transfer points
Temporary Storage Piles	--	Covers and application of dust suppressants
Cooling Tower	--	High-efficiency drift eliminators, with drift rate less than 0.0005%
Plant Roadways and Open Areas	--	Paving, vacuum sweeping and application of dust suppressants

* Limitation addresses particulate matter emissions. This also addresses emissions of other pollutants.

Total Plant Wide Potential Emissions (Tons/Year)

Pollutant	Potential Emissions Tons/Year
PM/ PM_{10}[1]	410
NO_x	2585
SO_2	4610
CO	2860
VOM	108
Fluorides[2]	50.2
Sulfuric Acid Mist	10.4
Beryllium	0.004
Mercury	0.10
Lead	0.31
Hydrogen Fluoride	50.2
Hydrogen Chloride	988

Explanation: Emissions for CFBs are calculated with continuous operation.

Notes:

1. Paved roads and Miscellaneous fugitive particulate matter emission sources have PM and PM_{10} emissions 4.5 and 0.9 tons per year, respectively.

2. The limit for fluorides is expressed in terms of hydrogen fluorides.